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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/781,314

02/17/2004

Youzhi E. Xu

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INTEL/BSTZ

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EXAMINER

FISCHER, JUSTIN R

ART UNIT

PAPER NUMBER

1791

MAIL DATE

DELIVERY MODE

10/16/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/781,314	Applicant(s) XU, YOUZHI E.	
	Examiner Justin R. Fischer	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-22 and 24-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16, 17, 19-22, 24-28 and 30 is/are rejected.
- 7) ☒ Claim(s) 18 and 29 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 22, 2008 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 16, 17, 19-22, 24, 27, 28, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mertol (US 6,008,536) and further in view of Miyao (JP 4-364764) and Nagesh (US 5,585,671). Mertol teaches an assembly comprising an integrated circuit 12 (heat generating device), a first thermal interface material 36 comprised of a thermal epoxy, and a heat spreader 16 (heat dissipating device) (Column 8, Lines 22+). The reference, however, is silent as to the presence of covalent bonds between the thermal interface material and the heat sink.

It is initially noted that the particular method in which the polymer is applied is related to the manufacturing method and does not further define the claimed structure of the claimed apparatus/system.

In regards to the heat spreader, Mertol is completely silent to the material used to form said spreader. However, it is well known to form such heat dissipating components from thermally conductive materials, including iron, as shown for example by Miyao. As such, one of ordinary skill in the art at the time of the invention would have found it obvious to form the assembly of Mertol with an iron heat spreader. In this assembly, the iron heat spreader is directly adjacent said first thermal interface material comprised of a thermal epoxy. It is emphasized that heat dissipating components are commonly formed of conductive materials, including metals and metal alloys.

Given such a structure, one of ordinary skill in the art at the time of the invention would have found it obvious to oxidize the surface of said iron heat spreader in order to provide good adhesion between the epoxy interface material and the iron heat spreader, as shown for example by Nagesh (Column 6, Lines 4-12). In an analogous manner to the claimed invention, the oxidizing step of Nagesh would have been expected to create covalent bonds between the epoxy interface material and the iron heat spreader. It is emphasized that the assembly of Nagesh is directly analogous to that of Mertol in view of Miyao in that it includes an epoxy layer directly adjacent an iron component. Lastly, one of ordinary skill in the art at the time of the invention would have expected covalent bonds to present since the above noted method is analogous to

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that of the claimed invention (applicant similarly achieves covalent bonds by oxidizing treatment).

Regarding claim 19, the interface material of Mertol comprises an epoxy matrix and conductive filler particles (e.g. silver) and such a composition is seen to constitute a molecular composite material.

With respect to claim 20, conductive filler particles having a wide variety of particle sizes and distributions are commonly used in thermal interface materials. One of ordinary skill in the art at the time of the invention would have found it obvious to use small and/or large filler particles and it appears that the claim language is directed to extremely smaller filler particles. Also, applicant has not provided a conclusive showing of unexpected results to establish a criticality for the claimed invention.

As to claim 22, the apparatus/system of Mertol, in view of Miyao and Nagesh, includes a thermal interface material comprising an epoxy matrix and a thermally conductive filler, wherein said filler would be covalently bonded to an iron heat spreader. A fair reading of the Mertol suggests the general use of a conductive epoxy material- such a disclosure suggests the use of a wide variety of epoxies, including those having a thermal conductivity greater than 4 W/mK and applicant has not provided a conclusive showing of unexpected results to establish a criticality for the claimed conductivity.

With respect to claims 27, 28, and 30, Mertol describes the claimed flip chip assembly (Column 3, Lines 25+).

4. Claims 16, 17, 19-22, 24-28, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (US 20010052652) and further in view of Miyao (JP 4-

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364764) and Nagesh (US 5,585,671). As best depicted in Figure 1, Smith teaches an assembly comprising a heat generating device 12, a first thermal interface material 14, a heat spreader 13, a second thermal interface material 16, and a heat sink 20. The reference further teaches that the interface materials comprise an epoxy matrix and conductive fibers, wherein said fibers have a thermal conductivity of at least 25 W/mK (Paragraphs 26 and 28).

It is initially noted that the particular method in which the polymer is applied is related to the manufacturing method and does not further define the claimed structure of the claimed apparatus/system.

In regards to the heat sink, Smith is completely silent to the material used to form said heat sink. However, it is well known to form such heat sinks from thermally conductive materials, including iron, as shown for example by Miyao. As such, one of ordinary skill in the art at the time of the invention would have found it obvious to form the assembly of Smith with an iron heat sink. In this assembly, the iron heat sink is directly adjacent a thermal interface material comprised of a thermal epoxy. It is additionally noted that heat dissipating devices, in general, are formed of conductive metals or metal alloys and thus, one of ordinary skill in the art at the time of the invention would have similarly found it obvious to form the heat spreader of Smith from iron and perform the aforementioned oxidizing step.

Given such a structure, one of ordinary skill in the art at the time of the invention would have found it obvious to oxidize the surface of said iron heat sink in order to provide good adhesion between the epoxy interface material and the iron heat sink, as

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shown for example by Nagesh (Column 6, Lines 4-12). In an analogous manner to the claimed invention, the oxidizing step of Nagesh would have been expected to create covalent bonds between the epoxy interface material and the iron heat sink. It is emphasized that the assembly of Nagesh is directly analogous to that of Smith in view of Miyao in that it includes an epoxy layer directly adjacent an iron layer. Lastly, one of ordinary skill in the art at the time of the invention would have expected covalent bonds to present since the above noted method is analogous to that of the claimed invention (applicant similarly achieves covalent bonds by oxidizing treatment).

As to claim 19, a composition of epoxy and conductive fibers is seen to constitute a molecular composite material.

With respect to claim 20, conductive fibers having a diameter of 10 microns can be used in the interface material of Smith and such an assembly is seen to define a nanocomposite material.

Regarding claims 27, 28, and 30, the claimed flip chip method represents one of the most common electronic packages in which an integrated circuit is attached to a printed circuit board (Nagesh provides one example of such a flip chip method). One of ordinary skill in the art at the time of the invention would have recognized the generic language of Smith as including the claimed flip chip assembly.

Allowable Subject Matter

5. Claims 18 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

6. Applicant's arguments with respect to claims 16-22 and 24-30 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Justin R. Fischer** whose telephone number is **(571) 272-1215**. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Justin Fischer
/Justin R Fischer/

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Primary Examiner, Art Unit 1791

October 8, 2008